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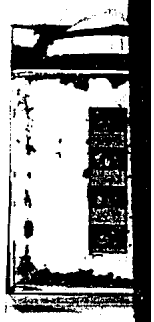

25TH ANNIVERSARY OF MOSCOW AVIATION INSTITUTE (SCHOOL OF SOVIET AIRCRAFT BUILDERS)

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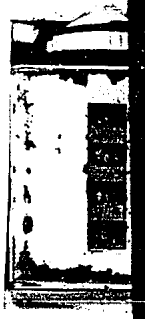
The indissoluble link between training and scientific research was the basis for the success and growth of the Soviet higher school. The history of the Moscow Aviation Institute imeni Sergo Ordzhonikidze, in particular, is convincing evidence of this. Founded in the years of the First Five-Year Plan, the institute has made great strides and has become one of the largest vuzes (higher educational institutions) of the nation and one of the leading scientific and training methods centers.

The institute is heir apparent to all the best created in our country in the field of aviation engineering training. It continued and expanded the remarkable traditions of the scientific and pedagogical school of the "father of Russian aviation," N. Ye. Zhukovskiy.

The Moscow Higher Technical School (MVTU) has played a decisive role in the creation of a higher aviation engineering school in our country. Here under the leadership of N. Ye. Zhukovskiy, were created the special disciplines which form the basis for the training of aviation engineers. In 1914, a diploma project in aviation was introduced into the school's curriculum; at that time, the training of an aviation engineer consisted of the study of a full cycle of subjects offered by the mechanics faculty, a series of special subjects, and training in the aerodynamics and light engine laboratories.

The progress of aviation science and engineering in the years immediately preceding World War I, and during the war, led to a differentiation between general courses on aeronautics, and to the creation of new special courses of study which were gradually introduced into the curriculum. The expansion in the special training of students, the introduction of diploma projects, and the formation of a series of special laboratories demonstrated the pressing need for the organization of an independent higher aviation engineering educational institution. In 1916-1917 innumerable plans were presented toward the organization of such a vuz; the most practicable plan was that of N. Ye. Zhukovskiy, proposing the establishment of higher aviation courses at the Moscow Higher Technical School. The proposed curriculum called for a 2-year study of only special subjects during a general engineering course, such training to be climaxed by a diploma project.

Despite the efforts of N. Ye. Zhukovskiy and the group of leading scientists, educators, and students led by him, a higher aviation educational institution was not organized in prerevolutionary Russia. Resolution of this problem proved possible only after the victory of the Great October Socialist Revolution. The insistance of the Communist Party and the Soviet Government on the expeditious creation of a mighty air force demanded a scientific base and the broad training of specialists. In 1918, the Central Aerohydrodynamics Institute was organized, and in 1919, a scientific and experimental airfield and aviation technical school -- the first aviation vtuz (higher technical educational institution), which school was reorganized into the Institute of Red Force Engineers imeni Zhukovskiy in 1920. Simultaneously, the training of aviation engineers was begun in eight other vtuzes; the most important place among them belonged to the MVTU, where there were created an aeromechanics specialty and, subsequently, an aeromechanics faculty.



The realization of the First Five-Year Plan and the rapid development of the aviation industry required the training of aviation engineers on a higher scientific plane and on a broader scale. Meanwhile, the training of specialists had been dispersed among many vuzes, which did not always possess the necessary material and technical base, plus scientific and pedagogical personnel.

The decisions of the November 1929 Plenum of the Central Committee of the VKP(b) on the development of a 5-year plan for the training of specialists, and the construction of new and the revision of the existing network of vtuzes, aimed at giving these vtuzes a sharply defined specialization, brought about a reorganization of the higher technical education system. In 1930, the Moscow Higher Technical School was split up into five independent schools. The aeromechanics faculty became the Higher Aeromechanics School, and that same year, was renamed the Moscow Aviation Institute (MAI), which brought together under "one roof" over half of the aviation faculties and departments then existing in the USSR: the aviation faculties of the MVTU and the Leningrad Polytechnic Institute, the aircraft engine department of the [Moscow?] Institute of Mechanics imeni Lomonosov, the aircraft engine specialty of the Tomsk Technological Institute, etc.

But the creation of the institute was not simply a mechanical unification of faculties and departments; its formation was a creative process: accumulated experience was critically evaluated and all of the more valuable experience carefully picked out. Thus, the first curricula of the MAI distinctly reflected the tendency to maintain the high general theoretical training of students.

From the very inception of higher aviation engineering training in our country, the preparation of aviation engineers was founded on a serious study of general theoretical subjects. Leading vuzes sought to train engineers capable not only of working with a narrow specialty, but capable also of solving scientific and technical problems.

MAI was intended to be a large vtuz, with a great number of laboratories, study rooms, and production shops, to facilitate the training process and to serve as a base for serious research.

Characteristics of the creation of a laboratory base at the institute was the fact that all work regarding the designing of laboratories, equipment, and instruments was done by professors and instructors, with the active cooperation of aspirants (graduate students) and students. The plan for the electronics laboratory was worked out under the direction of Academician B. N. Yur'yev. Plans for the basic laboratories of the engine building faculty were drawn up under the direction of Prof A. V. Krasnikov. This work gave the participants valuable experience. Often the critique of an error committed or of the elimination of a defect from a newly created instrument or installation became the topic of serious research. The accumulated material served as the basis for the design of new and improved equipment.

The concern and the attention of the Communist Party and the Soviet Government helped the collective of the institute to overcome innumerable difficulties. A little time went by -- and from barren space there sprang up buildings of the faculties of aircraft building and aircraft engine building, the aerodynamics and engine laboratories, the auditorium building, and the "student city."

Important scientific research work, indissolubly tied in with the training process, developed at the institute from its very first days of operation. The student body was drawn into the research and experimental design work of the chairs (kafedr). And in this the institute remained true to the traditions of the Zhukovskiy school.

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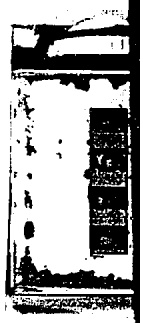


The energetic collective of the young vuz resolutely sought the solution of complex problems, and supported all undertakings in the field of aeronautics and aviation. Even the first years of the institute's existence were marked by interesting scientific and experimental design work. Highly demonstrative of this is the history of one of the first Soviet dirigibles, the "Komsomol'skaya Pravda." At the time, the development of dirigibles of domestic design was a responsible scientific and technical task. All the design and production work was done by members of the then existing aeronautics department, and was automatically introduced into the training process. Production practice training of students in the aeronautics department was linked closely with that of the construction and operation of the dirigible. An institute-wide order of April 1930 declared that "work on the 'Komsomol'skaya Pravda' was training work in all its ramifications."

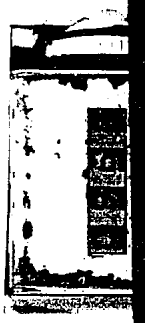
The designing and building of the dirigible helped "saturate" courses with new theoretical, design, and technological data, and, on the basis of the accumulated experience, made possible the formulation of new training aids. Upon the professors and instructors directing the work of building the dirigible was placed the responsibility "for presenting all calculations and sketches in a form ready for publication, and of keeping a precise record both as to the construction and the operation of the dirigible for subsequent use as a training aid for students."

In September 1931, the dirigible made its first flight. Thus was climaxed the work in which the most important characteristics of scientific research work at the institute were distinctly displayed: actuality of topic, organic tie between scientific and educational tasks, and the carrying into practice of theoretical and experimental research. All achievements in the perfection of the training process, in the equipment and modernization of laboratories, and in the growth of scientific and pedagogical cadres were inseparable from the scientific research work which the institute's staff has been carrying on uninterruptedly since the institute's organization. Close ties with production and direct participation in the execution of important industrial tasks enabled instructors to enrich lecture and practical training with the experience of leading plants and scientific research institutions, and to reflect in them the latest achievements of science and engineering.

The collective of the institute came forth as the initiator in the raising and resolving of a number of important scientific and technical problems. An example of such a problem, in the 1930's, was the construction of an all-steel airplane. In 1934, the "Stal'-MAI," constructed of stainless steel, was built at the institute from plans drawn up by D. P. Grigorovich and P. D. Grushin. The experience amassed in the process played an important role in the development of Soviet aircraft building.

In 1933, one of the first all-electron alloy [magnesium alloy] airplanes in the world was built at MAI. The designers were A. L. Gimmel'farb, N. F. Chekhonin, S. I. Zonshayn, V. V. Komarov, and a group of fourth- and fifth-year students. The use of electron as the construction material was a complex task; however, the institute not only succeeded in building the airplane, but was able to provide the answers to a number of problems posed by metallurgists and technologists.

Important theoretical and experimental research was carried on by the institute in the field of designing new types of flying machines. MAI made a particularly important contribution towards the creation of the first Soviet helicopters. Under the leadership of a professor at the institute, Academician B. N. Yur'yev -- originator of the world's first practical helicopter -- several helicopter designs, displaying high flight engineering qualities, were developed.



Laboratories of the aircraft building faculty did much in carrying out industrial assignments. Many Soviet Planes received their "ticket to life" in the airplane design testing laboratory. By participating in administering these tests, students acquired skills in conducting experiments and became acquainted with the latest airplane designs. Installations created for industrial testing were widely used in laboratory training.

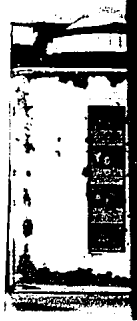
The aircraft building design bureau, organized in 1933 at the institute, played an important role in the development of scientific research, in coordinating it with the training process, and in using the results of theoretical research to create new airplanes. The bureau's staff was very small, with the basic work being carried out by professors, instructors, and students. Work in the design bureau served as a good school for hundreds of students. The bureau, directed during its first 3 years by the well-known aircraft, designer D. P. Grigorovich, and since 1936 by a graduate of the institute, now Prof P. D. Grushin, worked out many original airplane designs. It was there that the light engine airplane, the "Oktyabrenok," one of the first and best in the USSR, was created. The unique layout of the airplane, its interesting control system, and its light weight attracted the attention of the scientific and engineering public of the USSR and many foreign scientists to this machine. Conceived as a mass sports plane, the "Oktyabrenok" could be used successfully for flight training and the mastering of flying skills.

In addition to the "Stal'-MAI" and the "Oktyabrenok," the design bureau in 1939 conceived and built (through the efforts of the institute's collective) a high-speed airplane with the first tricycle landing gear. The airplane used other valuable design innovations, in particular, automatic flaps.

The collective of the institute solved a series of important scientific and technical problems in the field of aircraft engine building. Under the direction of Prof N. V. Inozemtsev, work was conducted on the physicochemical study and analysis of aircraft diesel engine operation, on the thermodynamics of carburetor-equipped engine operation, and on the selection of optimum antiknock combustion chamber design for kerosene engines. Under the direction of Prof A. V. Kvasnikov, research was done on the thermal analysis of internal combustion engines, the effective utilization of combustion gases, lean mixtures, the water-cooling of engines at high temperatures, and the extinguishing of flames in the intake manifold.

Side by side with theoretical and experimental research, there was carried out highly valuable work in design: a model of a hydraulic brake for the stand-testing of aircraft engines was created, which relieved the nation of the necessity of importing such a device; a central supercharge system for heavy airplanes was designed and built; and new and powerful aircraft engines were developed and put into production.

Together with the special chairs, the chairs of general engineering - also took an active part in scientific research work. In the aircraft materials study laboratory was born the idea of electrosurface hardening, which idea was later widely used in industry; the physics laboratory worked out methods for the spectral analysis of alloys; the electrical engineering laboratory designed and built such original instruments as the magnetoscope for determining flaws in metals, the magnetometer, and the universal electromagnet.



The wide range of research and experimental-design work at the institute, and the direct participation in it of a considerable portion of the student body, had great influence in improving the quality of specialist training. Students made valuable and original contributions through their diploma projects. A design for a high-speed passenger plane, worked out by a group of students in the form of a diploma project, was given a prize in all-union competitions in 1935.

The results of the first decade's work of the institute bear witness to the fact that MAI became a forge for aviation personnel, training thousands of highly qualified specialsits for the aircraft industry; the results of research also demonstrated the scientific maturity of the staff of professors and instructors.

The Great Patriotic War was a severe test for the collective of the institute. During the difficult days of the war, the institute continued to carry out the training of engineers in ever-increasing volume. The collective worked even more intensively at the resolution of scientific research and experimental-design problems linked with strengthening the combat might of the motherland. In 1945, for its special contributions in the field of training engineers for the aircraft industry, the Moscow Aviation Institute had conferred upon it the highest state award -- the Order of Lenin.

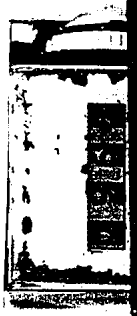
The postwar period was characterized by tremendous improvements in the field of aviation science and engineering. This placed complex and responsible tasks before the institute. In accordance with the requests of the aircraft industry, the institute reviewed its curricula and the training cross section of its graduating specialists. It was necessary not only to organize the training of engineers in new techniques, but also to make substantial changes in the training of engineers in existing specialties.

New faculties and specialties, chairs and laboratories were organized. Professors and instructors created anew special disciplines and training courses, for which they had laid the basis through theoretical and experimental research. The graduation of innumerable specialists in new fields of engineering bears witness to the fact that the growing and strengthening collective of the institute, is capable of coping successfully with its tasks.

The solution of the training methods problems placed before the institute during the postwar years is indissolubly linked with the new upsurge in scientific research work. We now have the right to speak of scientific schools and trends which have arisen at MAI. The aircraft industry well knows and appreciates the work of the institute's scientific collective.

Theoretical and experimental work in the study of aircraft engine operation is being conducted by members of the chair headed by Prof-Dr N. V. Inozemtsev. The scientific qualifications of these instructors is increasing: all members of the chair have academic degrees, and many of them have defended or are preparing doctoral dissertations. The vast theoretical and experimental data accumulated by the chair served as the basis for the creation of a new training course and textbook entitled "Gas Turbine Engines (Theory and Calculation)." Leading industrial specialists play a large part in the chair's research and training work.

In recent years increasing stress in research work conducted at the institute is being laid upon theoretical research. In this respect, the activity of the chair of aircraft aerodynamics is characteristic. For a long time now, under the direction of Prof-Dr G. V. Kamenkov, research has been carried on in the pressing question of the stability of unsettled motion in a fixed



time interval. This year, Docent A. A. Lebedev of the chair defended a doctoral dissertation, which, in the unanimous opinion of a number of well-known scientists, is a valuable contribution to the development of the theory of stability of motion. In addition, three candidate dissertations (two of them already defended) have been prepared. In solving these important theoretical assignments, the writers employed the general technical principles and methods worked out by the chair.

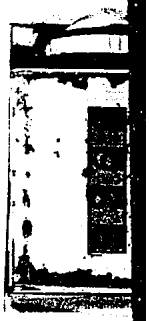
Great attention is devoted to familiarizing the scientific and technical public with the results of scientific research carried out by the institute, and of its employment in practice. The regular publications of Trudov MAI (Works of the Moscow Aviation Institute) and the holding of scientific and technical conferences on particular topics plays an important role in such familiarization. In the past academic year alone, over 10 such conferences were held, on heat-resistant alloys, electromagnetic and electronic systems of ultrahigh frequencies, propeller-driven machines, on problems of automatic regulation, etc. The conferences attracted the attention of innumerable representatives of industry and vuzes. Publication of the scientific works of the institute was also done on a wide scale; whereas 47 issues of Trudov MAI were published in the course of 25 years, some 20 issues have appeared over the past 2 years.

The Moscow Aviation Institute now possesses a highly qualified scientific and pedagogical collective. Among the professors and instructors at the institute are 2 active members and one corresponding member of the Academy of Sciences USSR, 2 corresponding members of the Academy of Pedagogical Sciences RSFSR, 48 professors and doctors of sciences, and 353 docents and candidates of sciences. Working hand in hand with the veterans of MAI are a young group of instructors and scientific associates. In 25 years the institute has trained 459 candidates and 22 doctors of technical sciences. In such a manner, alumni now constitute the basic nucleus of the institute's scientific and pedagogical cadres.

Professors and instructors of the institute have had a great deal to do in the preparation of textbooks and teaching aids. During the institute's existence over 200 textbooks and about 500 training aids have been published. These include such recognized textbooks as the already mentioned Gas Turbine Engines (Theory and Calculation), by N. V. Inozemtsev and V. S. Zuyev; Longitudinal Stability and Control of Aircraft, by I. V. Ostoslavskiy and G. S. Kalachev; Gas Turbine Engines (Design and Calculation of Parts), by G. S. Skubachevskiy; Aircraft Design, by M. N. Shul'zhenko; Experimental Dynamics, by B. N. Yur'yev; Heat Engines, by N. V. Inozemtsev; Experimental Aerodynamics, by A. K. Martynov, Aerohydrodynamics, by N. S. Arzhanikov and V. N. Mal'tsev; Power Installations, by V. I. Polikovskiy; and Resistance of Materials, by Ye. N. Tikhomirov. Many of these textbooks ran into several editions and have been translated into foreign languages.

Student scientific research circles have played an important role in the history of the higher aviation engineering school in our country. The many-sided scientific, experimental-design and popularization activities of these circles had great significance in the development of aviation science and engineering, and in the formation of a higher aviation engineering school.

"We are witnesses to the fact," Academician S. A. Khristianovich wrote in this regard, "that design bureaus, important scientific research institutes, and higher educational institutions have grown out of these student circles." (Izvestiya Akademii Nauk, No 8, 1951, p 1147).



This glorious tradition of our nation's aviation engineering school gained its further development in the scientific work of MAI students.

To the students of the institute belongs the credit for solving several interesting scientific problems. Created by them were plans and models of new aircraft designs, aircraft engines, instruments, and automatic devices. Results of student scientific research are discussed annually at student conferences.

At a conference dedicated to the 25th anniversary of the institute, some 85 reports were read. Side by side with purely theoretical research, plans were announced for new aircraft designs; and, simultaneously with plans for research into prospective problems, there was discussed work done in solving pressing production assignments, done in the course of practice training at plants. To prospective problems on the development of science and engineering were devoted, for example, the reports of students V. Kovalevskaya ("Problems of the Use of Atomic Energy in Cosmic Flights") and V. Bobkov ("Atomic Rocket Engines").

Increasing in number at MAI are the diploma projects which appear to climax the independent scientific research carried on by students in the course of their studies. The diploma project of V. Kukhtenko ("Application of Methods of the Theory of Stochastic Variables to Problems of Automatic Regulation and Control") is an example of such work.

The best works of students are published in the works of the institute. One of the issues of Trudov MAI issued this year consisted entirely of student scientific works.

The most valuable result of the 25 years of activity of the institute is, however, the training of many thousands of engineers. MAI alumni comprise the basic cadres of the Soviet aircraft industry's scientific and technical personnel. It is difficult now to find an aviation design bureau, plant, or scientific research institute which does not employ MAI alumni.

"The development of Soviet aviation owes much to the Moscow Aviation Institute," wrote Academician A. N. Tupolev in connection with the 25th anniversary of the institute. "Through the persistent work of MAI's collective was created a mighty aviation institute, which not only trained specialists in all the basic branches of aviation engineering, but also solved specific scientific problems independently."

The Moscow Aviation Institute owes all of its achievements to the concern of the Communist Party and the Soviet government. The 25th anniversary of the institute was marked by still another striking example of the party's and government's attention. The Council of Ministers USSR adopted a decree establishing at the institute three annual prizes for outstanding work in the field of aviation science and engineering, and comfirming a breast emblem for graduates of MAI.

Still ahead are many unsolved problems: there are no textbooks in some basic subjects, there are shortcomings in the organization and conduct of production training, the institute suffers from a need of scientific cadres with high qualifications, equipment in a number of laboratories lags behind the contemporary level of science, and research work of students is insufficiently developed.

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